Guidelines and quality criteria for artificial intelligence-based prediction models in healthcare: a scoping review

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Abstract

While the opportunities of ML and AI in healthcare are promising, the growth of complex data-driven prediction models requires careful quality and applicability assessment before they are applied and disseminated in daily practice. This scoping review aimed to identify actionable guidance for those closely involved in AI-based prediction model (AIPM) development, evaluation and implementation including software engineers, data scientists, and healthcare professionals and to identify potential gaps in this guidance. We performed a scoping review of the relevant literature providing guidance or quality criteria regarding the development, evaluation, and implementation of AIPMs using a comprehensive multi-stage screening strategy. PubMed, Web of Science, and the ACM Digital Library were searched, and AI experts were consulted. Topics were extracted from the identified literature and summarized across the six phases at the core of this review: (1) data preparation, (2) AIPM development, (3) AIPM validation, (4) software development, (5) AIPM impact assessment, and (6) AIPM implementation into daily healthcare practice. From 2683 unique hits, 72 relevant guidance documents were identified. Substantial guidance was found for data preparation, AIPM development and AIPM validation (phases 1–3), while later phases clearly have received less attention (software development, impact assessment and implementation) in the scientific literature. The six phases of the AIPM development, evaluation and implementation cycle provide a framework for responsible introduction of AI-based prediction models in healthcare. Additional domain and technology specific research may be necessary and more practical experience with implementing AIPMs is needed to support further guidance.